Estimated Female Breast Cancer Mortality-to-Incidence Ratio (MIR) of the Counties and Senatorial Districts Grouped to County Boundaries (SDGCs) in Missouri, 2008 - 2012

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BACKGROUND

- Mortality-to-Incidence Rations (MIRs) could expand the understanding of the demographic, environmental, and social factors which might lead to unexpected changes of mortality rates relative to incidence rates.
- MIRs could offer an influential method to explore cancer magnitude and prognosis.
- The MIR might help in exploring and addressing hidden differences in cancer consequences by area, age, and race.

STUDY AIMS

- To measure MIRs on Missouri senatorial districts grouped to county boundaries (SDGCs).
- To explore female breast cancer (FBC) racial and age disparities in Missouri.

METHODS

- MIRs by age and race for FBC cases were calculated by dividing age-adjusted FBC mortality rates by age-adjusted FBC incidence rates for the 20 SDGCs for the period from 2008 through 2012.
- We calculated approximate 95% confidence intervals (CIs) of the MIRs:
  1. Normal approximation to the log of the ratios using the delta method for the variance.
  2. Transformed the log-scale CIs back to the original scale.
- Results were measured per the 20 SDGCs, as Table 1 shows.

Table 1. Senate Districts Grouped to County Boundaries (SDGCs) and their Corresponding Senate District(s)

SDGCs #	*Senate Districts (SD) (N = 34) per SDGC*
SDGC #1	SD #6
SDGC #2	SD #10
SDGC #3	SD #16
SDGC #4	SD #18
SDGC #5	SD #19
SDGC #6	SD #21
SDGC #7	SD #25
SDGC #8	SD #27
SDGC #9	SD #28
SDGC #10	SD #29
SDGC #11	SD #31
SDGC #12	SD #32
SDGC #13	SD #33
SDGC #14	SD #34
SDGC #15	SD #s: 01,04,05,13,14,15,24,26 (Franklin, St. Louis City, St. Louis County)
SDGC #16	SD #s: 02,23 (St. Charles County)
SDGC #17	SD #s: 03,22 (6 counties south of St. Louis)
SDGC #18	SD #s: 07,08,09,11 (Jackson County)
SDGC #19	SD #s: 12,17 (15 Counties in northwest Missouri)
SDGC #20	SD #s: 20,30 (Christian & Greene Counties)

RESULTS

FBC MIR results were presented in tables and visualized using InstantAtlas software to show the ratios by age group (Table 2) and race (Table 3) for each SDGC.

Table 2. FBC MIRs by age, 2008-2012

	< 50			50-64			≥ 65		
SDGC	*MIR*	*95% CI LL*	*95% CI UL*	*MIR*	*95% CI LL*	*95% CI UL*	*MIR*	*95% CI LL*	*95% CI UL*
Missouri	0.12	0.11	0.13	0.17	0.12	0.15	0.26	0.16	0.24
#1	0.17	0.10	0.27	0.24	0.17	0.12	0.31	0.17	0.19
#2	0.10	0.05	0.18	0.21	0.10	0.10	0.26	0.14	0.15
#3	0.14	0.08	0.25	0.25	0.14	0.12	0.35	0.18	0.21
#4	0.17	0.10	0.28	0.22	0.17	0.11	0.32	0.15	0.20
#5	^	^	^	0.19	^	0.09	0.25	0.13	0.14
#6	0.22	0.14	0.35	0.26	0.22	0.13	0.35	0.18	0.21
#7	0.12	0.07	0.22	0.33	0.12	0.18	0.37	0.24	0.23
#8	0.11	0.06	0.20	0.28	0.11	0.14	0.37	0.20	0.22
#9	0.16	0.09	0.28	0.27	0.16	0.15	0.33	0.20	0.21
#10	^	^	^	0.21	^	0.09	0.29	0.14	0.18
#11	0.14	0.08	0.23	0.20	0.14	0.09	0.38	0.14	0.24
#12	0.16	0.09	0.27	0.27	0.16	0.13	0.37	0.19	0.22
#13	^	^	^	0.30	^	0.15	0.41	0.21	0.25
#14	0.09	0.05	0.16	0.20	0.09	0.10	0.31	0.14	0.18
#15	0.10	0.08	0.12	0.17	0.10	0.14	0.24	0.15	0.20
#16	0.10	0.07	0.15	0.16	0.10	0.10	0.27	0.13	0.18
#17	0.12	0.08	0.18	0.19	0.12	0.11	0.36	0.14	0.25
#18	0.16	0.13	0.21	0.23	0.16	0.16	0.28	0.19	0.21
#19	0.08	0.05	0.12	0.19	0.08	0.11	0.32	0.15	0.22
#20	0.12	0.08	0.18	0.19	0.12	0.11	0.27	0.15	0.19

Table 3. FBC MIRs by race, 2008-2012

	White			Black		
SDGC	*MIR*	*95% CI LL*	*95% CI UL*	*MIR*	*95% CI LL*	*95% CI UL*
Missouri	0.18	0.17	0.19	0.25	0.23	0.27
#1	0.19	0.16	0.24	^	^	^
#2	0.16	0.13	0.20	^	^	^
#3	0.21	0.17	0.25	^	^	^
#4	0.19	0.16	0.23	^	^	^
#5	0.14	0.11	0.18	^	^	^
#6	0.22	0.18	0.27	^	^	^
#7	0.22	0.18	0.27	0.35	0.19	0.65
#8	0.20	0.17	0.25	^	^	^
#9	0.22	0.18	0.26	^	^	^
#10	0.17	0.14	0.21	^	^	^
#11	0.21	0.17	0.25	^	^	^
#12	0.23	0.19	0.28	^	^	^
#13	0.24	0.20	0.29	^	^	^
#14	0.17	0.13	0.20	^	^	^
#15	0.15	0.14	0.16	0.24	0.21	0.27
#16	0.16	0.14	0.19	^	^	^
#17	0.20	0.18	0.24	^	^	^
#18	0.19	0.17	0.21	0.26	0.21	0.31
#19	0.18	0.16	0.21	^	^	^
#20	0.17	0.15	0.20	^	^	^

^: Suppressed due to small counts.

Figure 1. Area profile mapping report of 65+ female breast cancer (FBC) incidence rates by senate districts grouped to county boundaries (SDGCs) in Missouri, 2008-2012

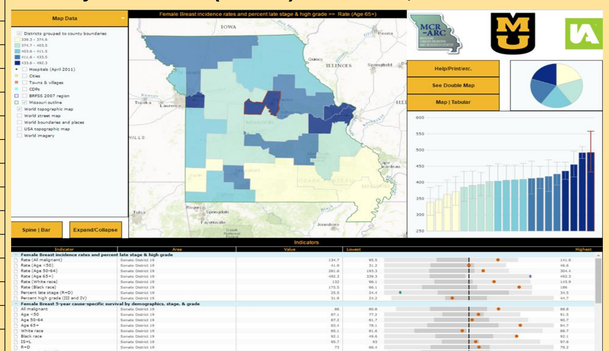


Figure 2. Area profile mapping report of female breast cancer (FBC) mortality rates of white females by senate districts grouped to county coundaries (SDGCs) in Missouri, 2008-2012

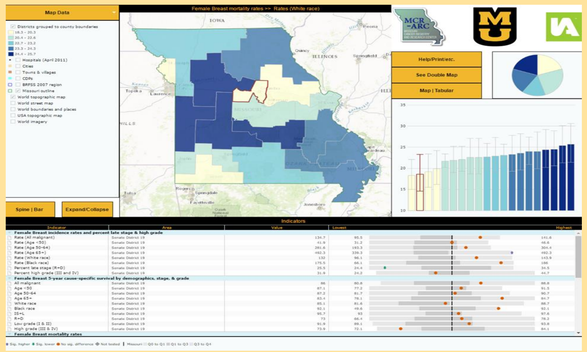
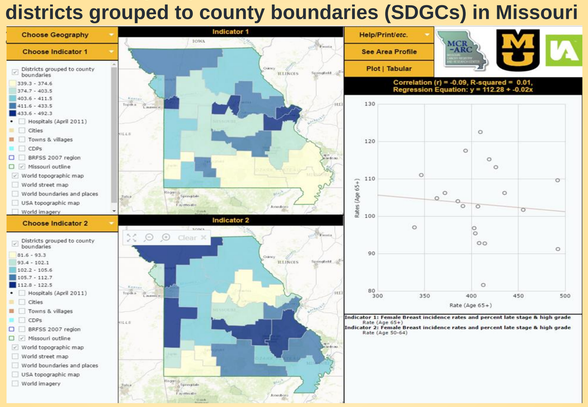


Figure 3. Double map InstantAtlas report of 65+ female breast cancer (FBC) incidence and mortality rates by senate districts grouped to county boundaries (SDGCs) in Missouri



DISCUSSION

- There are no previous efforts at MCR-ARC to assess MIR ratios among FBC cases by age and race in Missouri.
- By measuring these ratios, we could extend our understanding of the destiny of the diagnosed FBC cases.
- MIR results based on geographical limits could show inequalities and disparities in distribution of cancer based on race and age.
- Significantly high MIRs among the 65+ FBC cases, in comparison to the two younger age groups, might be interpreted as:
  - Comorbidities might limit management decisions such as exposure to strong chemotherapy courses with or without radiotherapy.
  - The death from causes other than breast cancer of the FBC cases might be missed by the death certificate writers to be attributed to the breast cancer.
  - The highest MIRs for the 65+ FBC cases were for rural Missouri. This could be attributed to a variety of factors such as lack of accessibility to appropriate oncology services, lack of treatment follow-up and compliance, poverty, and Medicare copayments.
- MIRs were higher among black females than white females.
- There were huge spatial rural-urban inequalities for the 65 and older FBC cases discovered by the current study. Higher MIRs were found for rural SDGCs than urban and metropolitan SDGCs. These findings could be attributed to:
  - Poverty, lack of coverage, and inaccessibility to available diagnostic and treatment options due to limited eligibility to Medicaid services for the poor and rural at-risk population.
- Despite Medicare coverage of 65+ year-old females across Missouri, the highest MIRs for the 65+ year-old FBC cases were for the rural Missouri. This could be attributed to:
  - Lack of accessibility of rural FBC cases to appropriate oncology services, lack of treatment follow-up and compliance, poverty, and Medicare copayment requirements.

CONCLUSIONS

- MIRs afford a distinctive measure of cancer inequalities which consider two very important measures, mortality and incidence rates.
- MIRs could be used to estimate the fatality of FBC and to explore FBC age and racial disparities by area.
- MIR ratios might help policy makers and intervention designers tackle FBC effectively and efficiently in Missouri.
- Missouri has many rural areas with low education levels and high rates of poverty. We need to explore all possible risk factors in addition to considering poverty and unequal distribution of resources among Missouri's population.

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